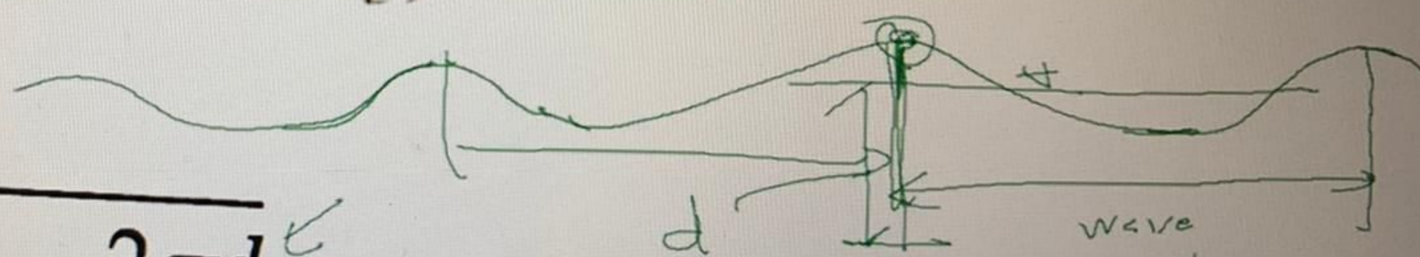
$$v = \sqrt{2g\frac{1}{2}\frac{L}{2\pi}} = \sqrt{\frac{gL}{2\pi}}$$

$d > L/2$ deep water wave

$$v = \frac{L}{T}$$ period

$$v = \sqrt{gd}$$

$d < \frac{1}{25} L$ (shallow water)



$$v = \sqrt{\frac{gL}{2\pi}\tanh\frac{2\pi d}{L}}$$

$\frac{1}{25}L \leq d \leq \frac{1}{2}L$

estimating maximum wave heights in inland lakes:

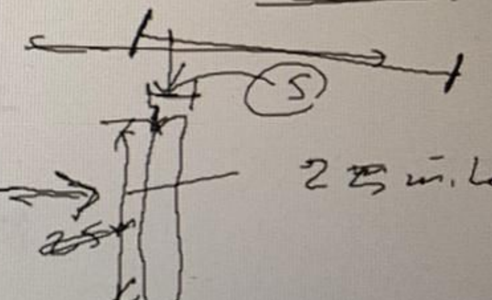
$$H_{max} = \begin{cases} 0.17\sqrt{UF} & \text{for } F > 20 \text{ miles} \quad (19\text{-}6) \\ 0.17\sqrt{UF} + 2.5 - \sqrt[4]{F} & \text{for } F < 20 \text{ miles} \quad (19\text{-}7) \end{cases}$$

Storm

H_{max} = maximum wave height, ft

F = fetch, statute miles

U = wind velocity, statute mph



✓ 5280 ft

significant wave height

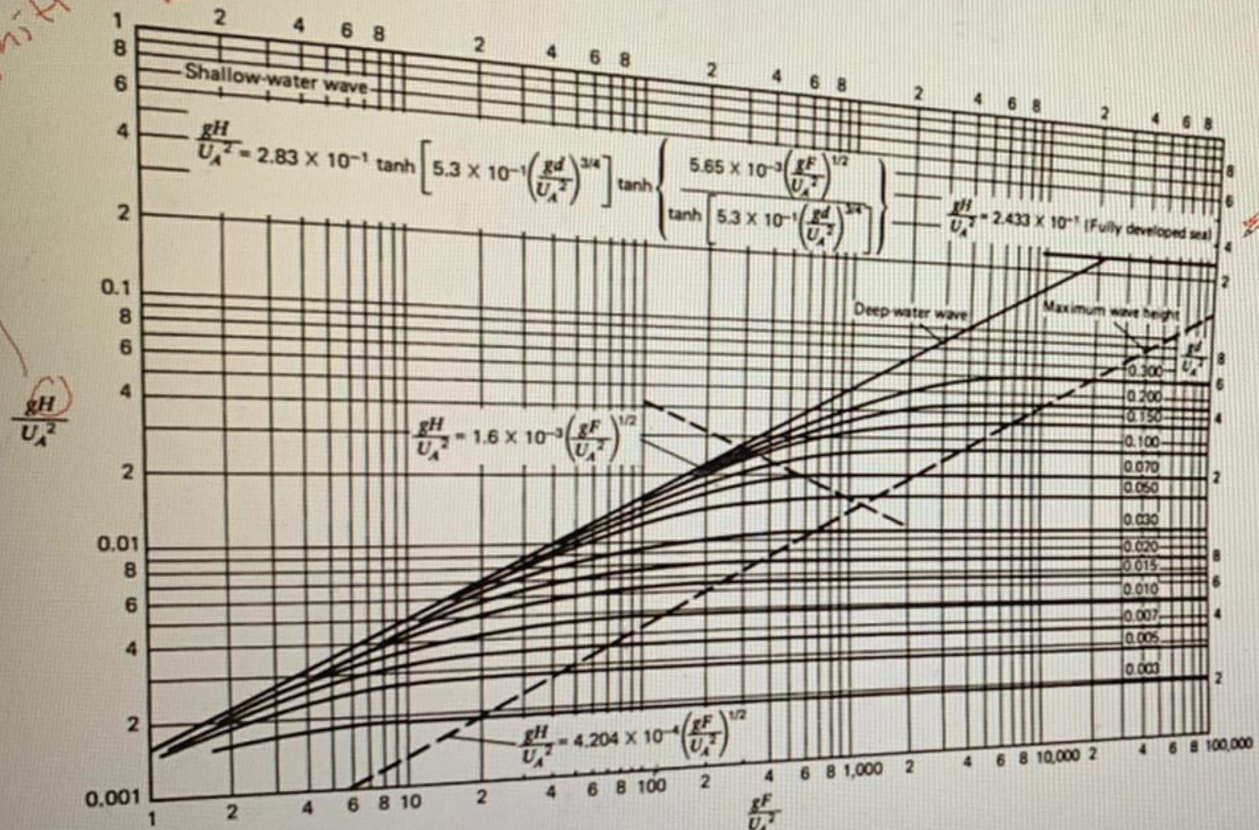


Figure 19-4 Forecasting curves for wave height. Constant water depth. (Source: Reference 8.)

$H_{max} = 1.87 \times$ significant wave height wind speed

$$U_A = 0.71U^{1.23} \qquad (U \text{ in m/s}) \qquad (19\text{-}9a)$$

$$\boxed{U_A = 0.589U^{1.23} \qquad (U \text{ in mph}) \qquad (19\text{-}9b)}$$

Do not use

wind stress factor

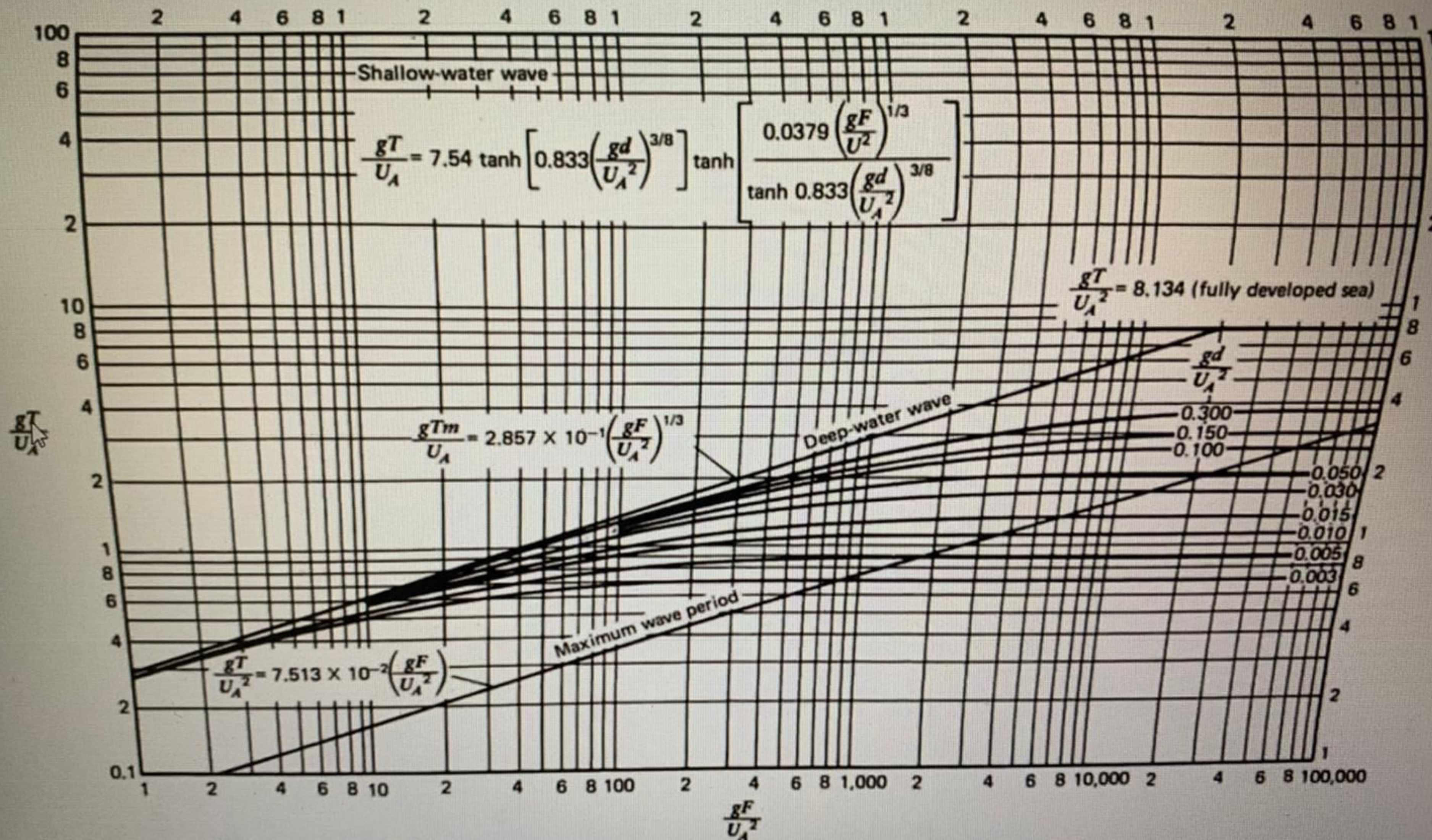


Figure 19-5 Forecasting curves for wave period. Constant water depth. (Source: Reference 8.)

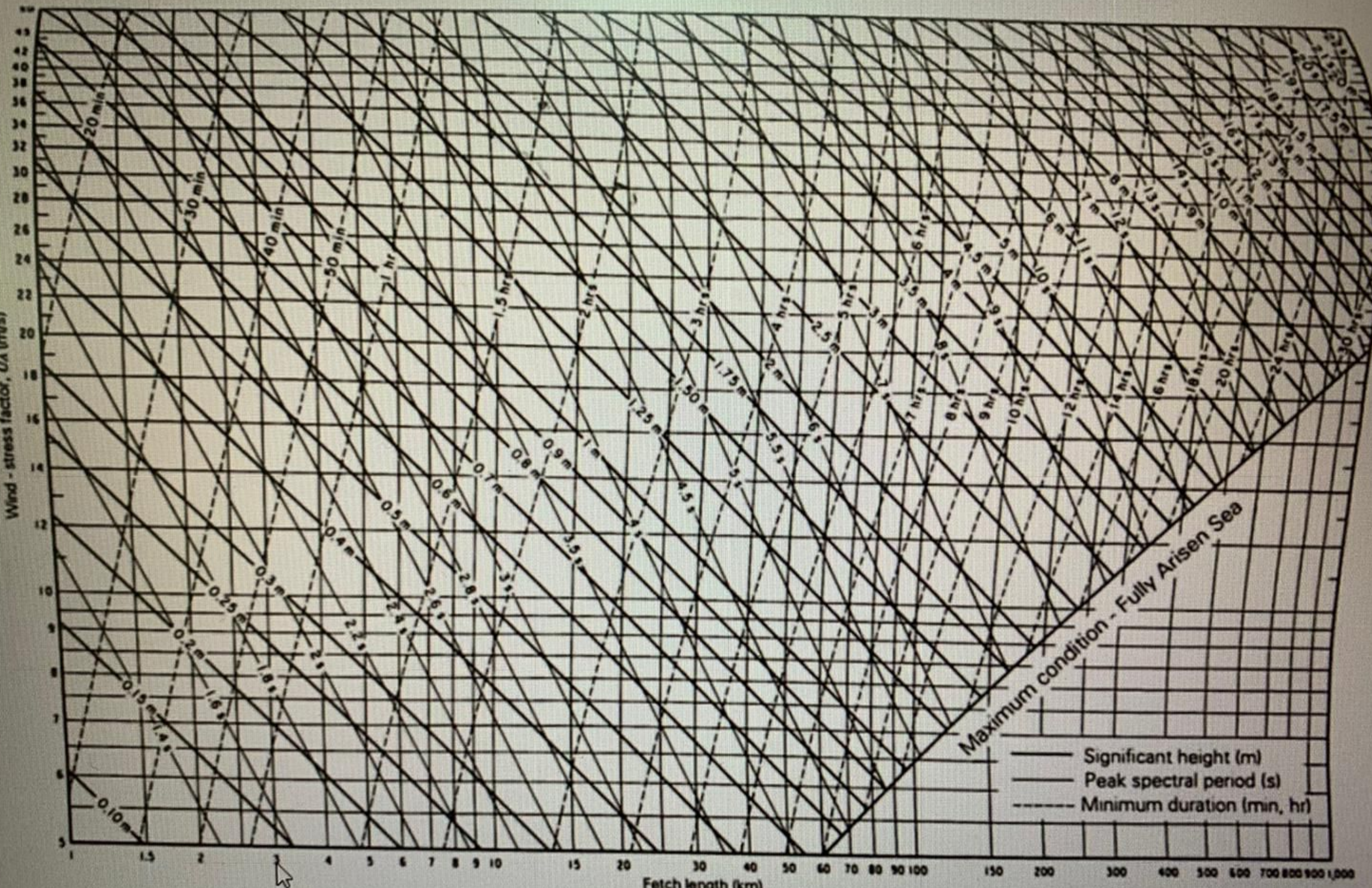


Figure 19-6 Nomogram of deep-water significant wave prediction curves as functions of wind-stress factor, fetch length, and wind duration. (Source: Reference 8.)

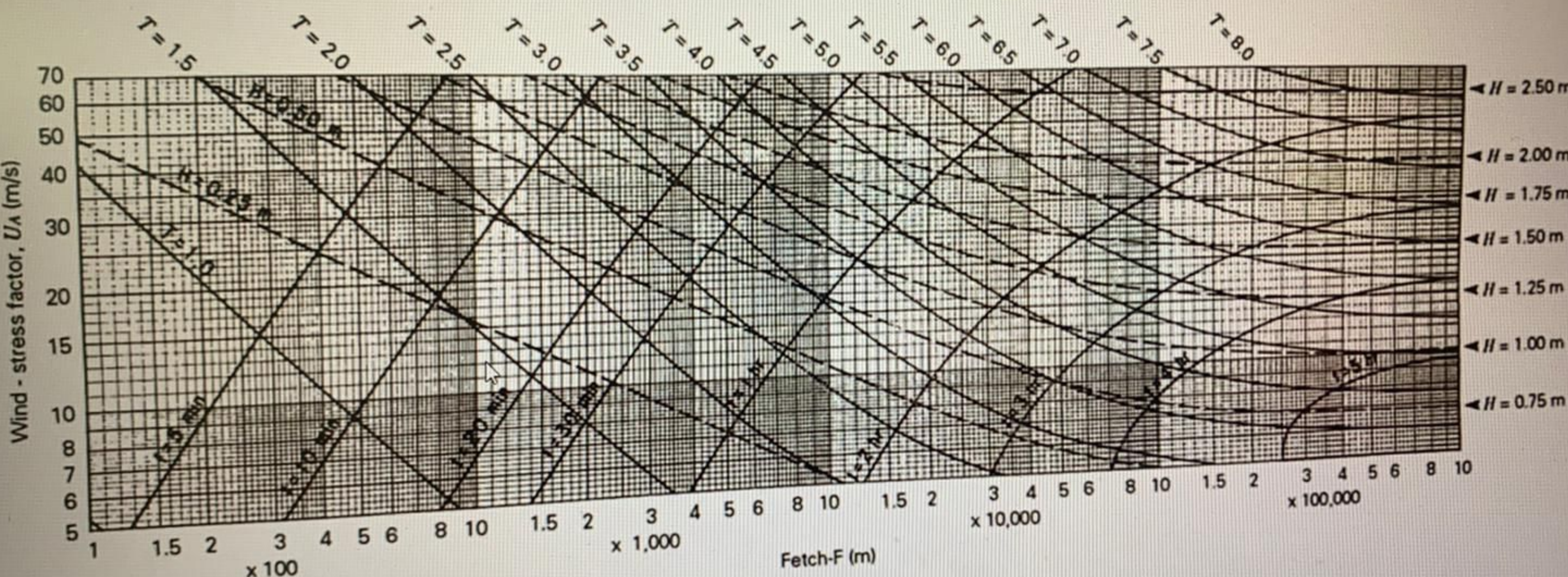


Figure 19-7 Forecasting curves for shallow-water waves with constant depth = 6.0 m. (Source: Reference 8.)

Example19.1: Given the fetch 15km, wind stress factor 20m/s and mean water depth 6 meters determine the significant wave height and period

$$\frac{gd}{U_A^2} = \frac{(9.8)(6)}{(20)^2} = 0.147$$

$$\frac{gF}{U_A^2} = \frac{(9.8)(15000)}{(20)^2} = 368$$

$$\frac{\overset{9.8}{\cancel{g}}H}{\underset{20}{\cancel{U_A}}^2} = 0.025 \Rightarrow H = 1.02 \text{ m}$$

$$\frac{\overset{9.8}{\cancel{g}}T}{\underset{20}{\cancel{U_A}}} = 1.8 \Rightarrow T = 3.7 \text{ sec}$$

00:46:22 / 01:19:35

Example19.1: Given the fetch 15km, wind stress factor 20m/s and mean water depth 6 meters determine the significant wave height and period

$$\frac{gd}{U_A^2} = \frac{(9.8)(6)}{(20)^2} = 0.147$$

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$$\frac{\overset{9.8}{\cancel{g}}H}{\underset{20}{\cancel{U_A}}^2} = 0.025 \Rightarrow H = \underline{\underline{1.02}}\ m$$

$$\frac{\overset{9.8}{\cancel{g}}T}{\underset{20}{\cancel{U_A}}} = 1.8 \Rightarrow T = 3.7\ sec$$

by Fig 19.7 $H = 1.0$ m check o.k

$T = \underline{3.6}$ " "

deep water

Example 19.2: Given a fetch of 25km, a wind stress factor of 18m/s and mean water depth of 10m, determine the significant wave height and period. If the storm that produced the winds lasted only 1.0hr, how would this affect your answer

$$\frac{gd}{U_A^2} = \frac{(9.8)(10)}{18^2} = 0.30$$

$$\frac{gF}{U_A^2} = \frac{(9.8)(25000)}{18^2} = 756$$

Fig 19.4 : $\frac{gH}{U_A^2} = 0.037 \Rightarrow H = 1.22\text{ m}$

fig 19.5 $\frac{gT}{U_A} = 2.3 \Rightarrow T = \cancel{6.4} = 4.2$

check fig 19.6 , $H = \cancel{4.4}$ 1.4 check ok

$T = 4.7$ check ok

If storm only lasted one hour

$H = 0.65$ m

$T = 2.8$ sec) from fig 19.6

- Current: Caused by wave action by which water particles does return to their original position (from Florida Atlantic coast to England (4mph NE))

- Tide: The alternate rising and falling of the water surface caused by gravitational attraction of the sun and moon (twice every lunar day 24 hr and 50 minutes

  Mediterranean ~ 0.5 m
  Bay of Fundy ~ 30 m

Physical and Mathematical models (p.596)

Deterioration and Treatment of Marine Structure (wood, concrete, and steel): Reading p.597